Chapter 2
Enterprise Geographic Information Systems (EGIS)

2-1. Introduction

The purpose of this Chapter is to define Enterprise GIS and its importance to the organization and provide general guidance on Enterprise GIS implementation.

As defined in Chapter 1, Geospatial Data and Systems include data and technologies from GIS, Remote Sensing, Survey and Mapping, Global Postitioning System (GPS), CADD, and Facility Management fields. GIS is singled out in an Enterprise context because of its strong integration capabilities. Data collected and/or derived from various geospatial technologies are easily integrated through GIS. Any reference to Enterprise GIS, implies geospatial information collected and/or derived from geospatial technologies.

2-2. Geographic Information Systems (GIS)

Traditionally, the parts of GIS have been discussed in terms of data, software, people and hardware/systems. Initially, GIS required specialized hardware and expensive software that only highly trained experts could run. Those requirements are no longer constraints. Today, GIS runs on common network configuration with desktop hardware and the software is reasonably priced. While workforce development will always be an issue, training on the use of the software is easily obtained. (See Chapter 3).

As software and hardware have become more main stream, geospatial data has become much more complex. Not only has the complexity of the internal data format increased, but data management issues have risen driven by the increase in the volume of the data (both size of databases and/or files and number of datasets available).

The data needed for GIS analysis is by far the most expensive part of implementing GIS. In 1993 it was estimated by OMB, that USACE spends $200,000,000 annually on collecting, processing, and archiving geospatial data. Geospatial data is an integral part of the Corps business process from project planning to operation and maintenance. There is a huge potential for loss through data mismanagement. It becomes easily outdated simply because the data can not be retrieved or it was not documented properly at the time of collection. The importance of standardizing, documenting and providing easy access to geospatial data can not be overstated.

"GIS is a … digital database in which a common spatial coordinate system is the primary means of reference. Comprehensive GIS require a means of

- Data input, from maps, aerial photos, satellites, surveys, and other sources
- Data storage, retrieval, and query
- Data transformation, analysis, and modeling, including spatial statistics
- Data reporting, such as maps, reports, and plans

Three observations should be made about this definition:

> First, GIS are related to other database applications, but with an important difference. All information in a GIS is linked to a spatial reference. Other databases may contain locational information (such as street addresses, or zip codes), but a GIS database uses

geo-references as the primary means of storing and accessing information.

Second, GIS integrates technology. Whereas other technologies might be used only to analyze aerial photographs and satellite images, to create statistical models, or to draft maps, these capabilities are all offered together within a comprehensive GIS.

Third, GIS, with its array of functions, should be viewed as a process rather than as merely software or hardware. GIS are for making decisions. The way in which data is entered, stored, and analyzed within a GIS must mirror the way information will be used for a specific research or decision-making task. To see GIS as merely a software or hardware system is to miss the crucial role it can play in a comprehensive decision-making process." - Kenneth E. Foote and Margaret Lynch, The Geographer's Craft Project, Department of Geography, University of Texas at Austin

2-3 Enterprise GIS

Often an individual business function or business unit within an organization drives GIS implementations. For example. hydrographic survey data is collected to monitor dredging projects, imagery is collected for a beach erosion study and soil data is collected to evaluate the structural capacity of a site. USACE also has the added complexity that functional areas across the organization do not develop GIS capabilities uniformly across the organization. For example, District A may have developed a detailed well documented dataset to support its regulatory mission, District B may not have had a large regulatory mission; therefore, never established a dataset.

While support of mission requirements is, of course, the focus of any data collection activity and must not be compromised, data collection activities should also be approached as collecting information to be used by the entire organization. Mission specific data needs to be collected and disseminated throughout the organization. This is the concept of Enterprise GIS. Data collected for dredging is also available to the USACE planning studies. Soil data collected for engineering may be of use to environmental studies. Information collected for regulatory permits is available for watershed management studies. The sharing of the technology and the data associated with that technology across a multi-disciplinary organization, or across loosely associated organizations is the concept behind Enterprise GIS (See Figure 1).

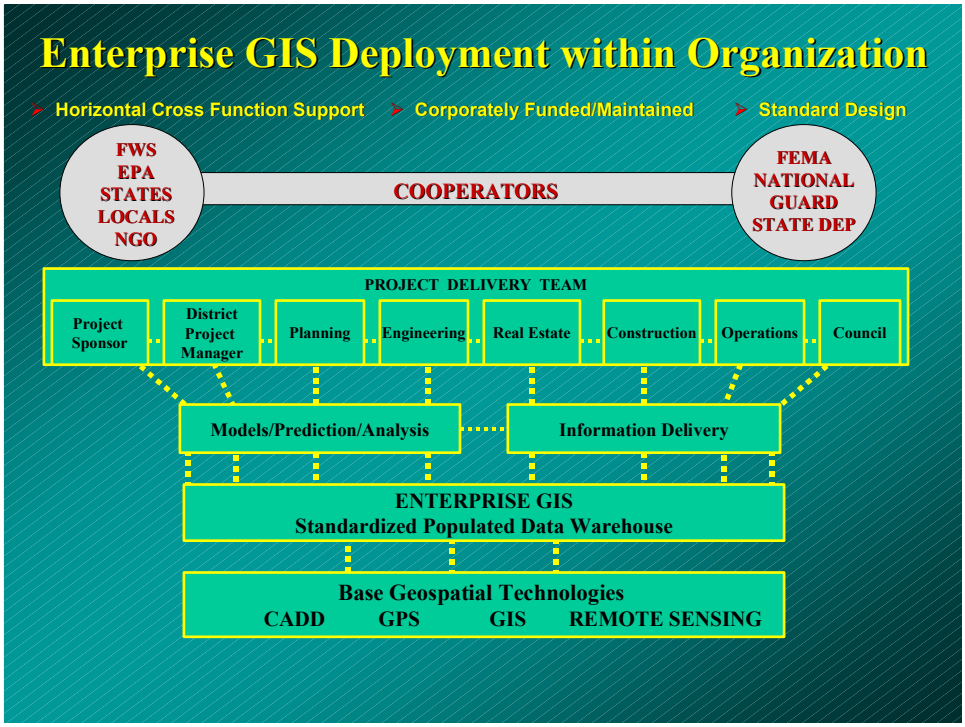


Figure 1: A Conceptual View of Enterprise GIS

Enterprise GIS (EGIS) is the integrated geospatial technology *infrastructure* delivering spatial information products, services and standard datasets to all functional elements and *business processes* of the organization. EGIS provides easy access to existing geospatial data sets, establishes standards for how an organization collects geospatial data and integrates non-spaital data from existing Database Management Systems (DBMS). Implementing EGIS supports the horizontal integraion of USACE's missions and directly supports the NSDI; collecting, storing and documenting data to support multiple purposes and reuse.

Just as the USACE organization can be discussed at different levels, the entire USACE Command, a USACE District Office, a USACE Division, etc.; EGIS can be implemented at different levels with the "enterprise" reflecting the level of the command. There is a definite distinction between a HQ Enterprise effort focused on national coverage of USACE assets and a District EGIS effort focusing on the District's mission area and data collection efforts.

As EGIS is implemented at various Commands throughout USACE, Corps wide standards, metadata and data accessibility need to be addressed corporately; so that the information is available not only throughout the specific command, but also throughout the entire USACE organization. There needs to be an integrated national level view of Corps' infrastructure (horizontal integration) as well as a capability to view detailed geospatial data (vertical integration) of USACE data (Figure 2).

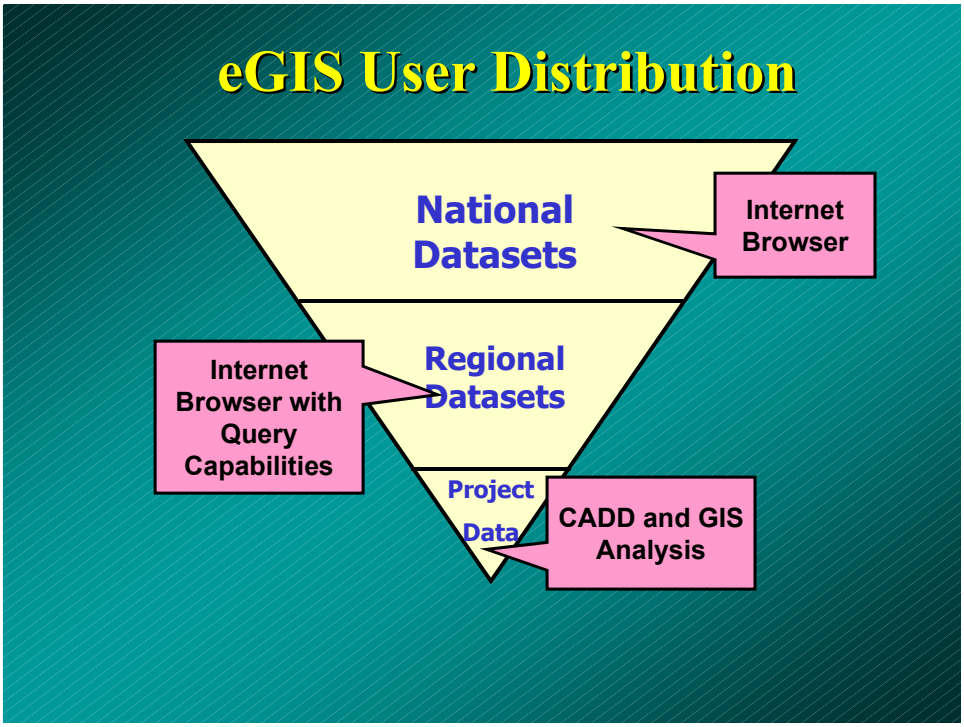


Figure 2: Distribution of Users. Many users are interested in browsing national datasets, fewer users are require accessing regional datasets, and only a few require access to project data.

2-4 HQUSACE Enterprise GIS

The HQUSACE EGIS is developed under the guidance of the HQ Geospatial Project Management Team (PMT) (formarly the HQ Geospatial Committee – See Chapt 3). The HQ Geospatial PMT is committed to working together in the area of geospatial data and technology to decrease development costs for GIS functionality for USACE wide Automated Information Systems (AIS)'s. The implementation of HQUSACE EGIS is CorpsMap.

CorpsMap is a spatial "portal" that accesses a variety of existing USACE wide databases. CorpsMap is an internet map-based display and information dissemination system, for various Corps databases that have geographically-based information in digital form. CorpsMap enables USACE information to be easily accessed, creates maps easily and integrates disparate databases.

CorpsMap can be accessed at https://corpsmap.usace.army.mil .

The remainder of this chapter deals with Division/District EGIS efforts.

2-5 The Benefits of EGIS

As is the case with many IT initiatives, it is difficult to quantify the benefits of EGIS. The tangible benefits of EGIS include:

1. Savings
    a. Data Retention - increase life of data; instead of completely recollecting data, build on existing data
    b. Data Management – Since data is more easily accessible, it increases productivity

c. Improve Data Sharing - groups get together and collaborate on a data collection effort, decreases data duplication
d. Increase efficiency - decrease effort to do a task; measured in time
e. More efficient/effective review and approval – everyone working on the same spatial data

2. Improve Product Quality
   a. Better decisions (more defendable)
   b. More complete picture – supports more complex anaysis/solutions

2-6 Implementation of EGIS at Division/District Commands

It is unrealistic for a District office to make the jump from project specific GIS applications to Enterprise GIS without working through the challenges and obstacles present with changing business processes. As with any cultural or business process change, EGIS takes time to work within an organization. While many offices are not ready to develop a full blown EGIS capabilities, there are steps that can be taken to ensure it is a success once a District office makes the decision to move in that direction.

a. Phase I: Provide Easy Access to External Data. This phase involves providing easy access to external data sources to everyone in the District. Internet or Intranet technology makes it relatively straight to implement Phase I. Many Federal and State agencies are making their geospatial datasets available through the internet. Phase I may simply be establishing a web page with links to all the online data covering a Districts geographic area. Most data required for recon and feasibility studies is at the state level. If the State does not host their own data, the District office may want to collect the data from the state and host it on the District Intranet for easy access by the entire District.

While Phase I is not intended to solve the geospatial data requirements of the entire District, it is a good first step toward working together and providing data to the entire District office. As mentioned, much of the data from other sources is valuable for feasibility and recon studies. By establishing easy access to this data and maintaining its currency, cutting down on various stovepipes individually requesting it from state or local agency. Also, easy access gets folks fired-up for the second phase, which is more difficult.

b. Phase II. Data Inventory. Phase II involves inventorying what types of data is being collected by the District on a regular basis and how much legacy data the District owns. USACE produces a tremendous amount of geospatial data in support of its mission. USACE also has a large amount of historic or legacy data that may not be in digital form. During this phase, the District office needs to compile a listing of legacy data and document where it is and in what format. It is cost prohibitive to convert all legacy data into a format to support the Enterprise. Not all legacy data is needed and this inventory will be used to support decisions on what legacy data needs to be incorporated into the Enterprise GIS. In addition to legacy data, the District office needs to get a handle on what type of data and how much data is being collected on a regular basis. Some of the geospatial data needs to be accessed by the entire District, but not all of it.

This will vary from District to District. A District office with a large navigation mission may establish a requirement that navigation data needs to be accessed by the entire organization, while an office with a small navigation mission will not have the same requirement. Often large projects or studies will require data to be accessed by many individuals in the District.

Since the Geospatial Program Management Team (GeoPMT) has representation across the District (See Chapter 3 and 4), this should be a primary task of the committee. Establish a core set data that needs to be accessed by a large population and establish guidelines for how non-core data should be managed. Need to see if there is USACE guidance that would impact some decisions; such as navigation issues.

c. Phase III: Enterprise Geospatial Data. Phase III involves integrating data collection and dissemination into Corps business practices throughout the organization. The remainder of this chapter relates to Phase III.

2-7 Aspects of Successful EGIS at Division/District Commands

Four major areas need to be addressed by each Command in order for a successful EGIS implementation.

a. Data Stewardship and Integrity – (See chapt 8)

b. Data Standards and Documentation – (See chapter 7)

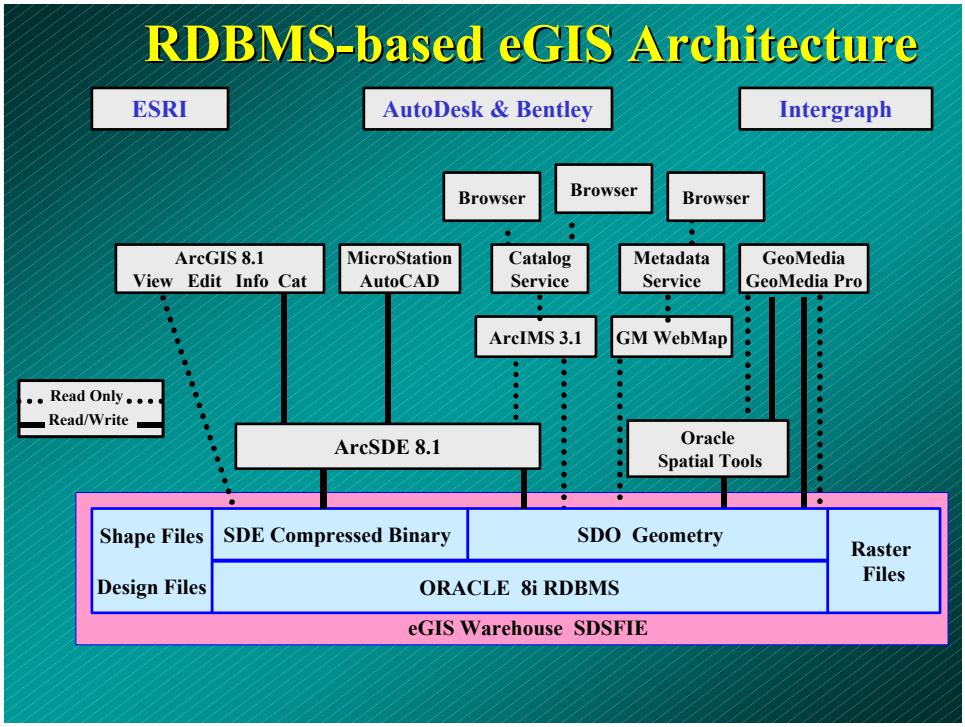
c. *Business Process/Work Flow* – This needs to be discussed in detail at each Command

d. Workforce Development – (See Chapter 4 for more details)

Other Elements that aide in implementing EGIS succesfully

- EGIS corporate vision
- Active Geospatial Project Management Teams (technical and oversight committees)
- Division level coordination
- RMB and BOD approval
- Strategic and tactical components
- Performance monitoring
- Geospatial Project Management Plan (Implementation Plans)
- Cost estimates
- Funding guidance

2-8 Sample EGIS Architecture


RDBMS-based eGIS Architecture
ESRI
AutoDesk & Bentley
Intergraph
Browser
Browser
Browser
ArcGIS 8.1
View Edit Info Cat
MicroStation
AutoCAD
Catalog
Service
Metadata
Service
GeoMedia
GeoMedia Pro
ArcIMS 3.1
GM WebMap
Read Only
Read/Write
ArcSDE 8.1
Oracle
Spatial Tools
Shape Files
SDE Compressed Binary
SDO Geometry
Raster
Files
Design Files
ORACLE 8i RDBMS
eGIS Warehouse SDSFIE